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# Behavioural risk factors and attitudes to preventive measures: changes during the COVID-19 pandemic

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## ABSTRACT

**Background:** Prevalence of behavioural Risk Factors (RF) of Non-Communicable Diseases (NCD) has changed during the COVID-19 pandemic. The impact on compliance with preventive measures required additional study. **The aim:** To analyse changes in people's lifestyle during the COVID-19 pandemic and specify the determinants associated with the attitude to the vaccination program. **Materials and methods:** The study was conducted in 2021 through an online survey of the population. A sample for comparison was formed from the economically active population participated in the 2017/2018 study. Sociological and statistical methods were used. **Results:** An increase in sweet consumption was discovered. There was a decrease in physical activity (56%), a higher prevalence of smoking among women (29%). With a positive attitude to the COVID-19 vaccination, 91% of respondents received at least one dose of the vaccine and with a negative or neutral – 16%. **Conclusions:** The identified lifestyle changes give reason to expect an increase in the incidence of NCD. A positive attitude to vaccination could confirm a fairly high level of patient activation.

**Keywords:** Risk factors, Non-Communicable diseases, COVID-19 vaccination, patient activation.

## 1. INTRODUCTION

Until recently, the medical community focused mainly on the prevention of NCDs and the correction of behavioural RF to reduce the rate of premature mortality. With the beginning of the COVID-19 pandemic, the weight of the NCD problem did not decrease, but it gave way to the challenges of rapid spread and severe course of SARS-CoV-2 viral infection, which was more often observed in people living with NCD (WHO, 2020; Williamson et al., 2020). At the same time, a study of the risk profile of NCD among employees of the University of Indonesia and its association with infection showed that the risk of COVID-19 infection increased even with a high prevalence of RF

and required an urgent program of behavioural measures to manage those (Widyahening et al., 2022).

After the development of vaccines against the SARS-CoV-2 virus, the next problem was immunisation coverage of the most significant number of people to ensure collective immunity (Krammer, 2020; Bartsch et al., 2020; El-Elimat et al., 2021). On the one hand, society faced structural barriers (availability of a vaccine, access to a service), which were eliminated by the efforts of states and health systems, on the other hand, the obstacles were people's beliefs or ideas who agreed or did not accept the service and thus affected the success of vaccination programs in general (Zhang & Fisk, 2021; Mir et al., 2021). Scientists using regression models have shown a significant association between social attitudes and people's intentions to get the COVID-19 vaccine (Graupensperger et al., 2021); between risks and severe outcomes of the disease (Williamson et al., 2020). Given the undulating course of the pandemic, the decline in morbidity was used to mobilise the medical industry and society to counteract the next outbreak and inform the population about prevention measures. Compliance with preventive behaviour, which was specific to COVID-19, considered as preparation for future infection outbreaks (Zhang et al., 2021; Graupensperger et al., 2021).

Some reports were alarming as with the development of the pandemic, the percentage of people who intended to get vaccinated decreased, the presence of chronic diseases did not increase the intention to get vaccinated, even if these groups had an increased risk of death from COVID-19 (Robinson et al., 2021). Not only people's lifestyle played a role, but also patient activation, a sufficiently high level of which increased positive attitude toward preventive measures and vice versa (Greene et al., 2015). The introduction of mandatory immunisation has had an ambiguous impact on the population's attitude to vaccinations against COVID-19. In addition, during the pandemic, people's lifestyles and the prevalence of behavioural RF have changed. The impact on compliance with preventive measures required additional study.

The aim was to analyse changes in people's lifestyle during the COVID-19 pandemic by Behavioural RF of NCD compared to the pre-COVID period and specify the determinants associated with the population's attitude to the COVID-vaccination program and its compliance.

## 2. MATERIALS AND METHODS

The cross-sectional study was conducted online using a specially designed questionnaire in Chernivtsi in September 2021. The study involved 154 respondents ( $M_{age}=30.53$ ;  $SD=12.68$ ), the response rate was 96.25%. The total number was 40.91% male and 59.10% female. For comparison, we used data from the study of the prevalence of RF of NCD and the respondents' medical activity regarding their health (patient activation) among the economically active population in Chernivtsi in the pre-COVID period, 2017-2018 ( $N=1252$ ). The sample ( $n=218$ ) consisted of residents of one of the city's districts. It was representative of the study group by gender distribution (45.87% of men and 54.13% of women) and level of education (80% of people aged 25-44 years with higher education) ( $M_{age}=38, 48$ ;  $SD=11, 78$ ). The STEPS instrument was a reference point for developing the questionnaire. Sociological (online survey) and statistical methods were used, such as PIVOT, chi-square test ( $\chi^2$ ), step-by-step multiple logistic regression, probability of an event (P). A p-value less than 0.05 ( $p<0.05$ ) was considered significant.

## 3. RESULTS

According to the study results, it was found that during the pandemic period, compared to the pre-COVID period, control over nutrition or compliance with a healthy diet did not change, since this was reported by 55.19% of respondents in 2021 and 56.39% in 2017/2018. Sufficient fruit consumption was observed by 45.41% in 2021 and 46.75% in 2017/2018; fish was consumed 2-3 times a week by 20.22% and 18.18%, respectively. Sweet consumption has increased during the pandemic, as the restriction on sweets has decreased from 42.35% in the pre-COVID period to 22.73% in 2021 ( $\chi^2=10.102$ ;  $p=0.002$ ). Moreover, people under the age of 25 or after 45 years (17.35% each) began to limit sugar less than those aged 25-44 years (32.14%) ( $\chi^2=4.442$ ;  $p=0.036$ ). In 2021, the ratio of fatty, salty, and fast food, in general, was 37.66%. Men were less likely to limit harmful food ingredients than women: 25.40% vs 45.05% ( $\chi^2=6.171$ ;  $p=0.013$ ).

In the pre-COVID period, more respondents considered themselves physically active (67.67%) than in 2021 (55.84%), ( $\chi^2=3.864$ ;  $p=0.05$ ). Daily physical exercise almost did not change (17.89% and 15.58%, respectively). The proportion of those who worked out in gyms significantly decreased from 34.86 to 9.74 ( $\chi^2=30.824$ ;  $p<0.001$ ). This decrease occurred among both men (from 41.00% to 14.29%) and women (from 29.66% to 6.59%). Women partially compensated for the lack training in gyms by yoga classes (7.69%) and walking up to 3 km daily (69.23% vs. 54.76% before the pandemic, ( $\chi^2=3.893$ ;  $p=0.049$ ). If in 2017/2018 51.88% of respondents of both sexes walked enough, then in 2021 – 66.23% ( $\chi^2=6.106$ ;  $p=0.014$ ). During the period of anti-epidemic restrictions, 16.23% practised walking as physical activity (without a fixed distance or duration), 10.39% did not report any activity.

In 2021, 44.44% of male respondents reported smoking tobacco (in 2017/2018-40.00%). Female respondents smoked in 28.57% of

cases, more than in 2017/2018 – 16.95% ( $\chi^2=4.043$ ;  $p=0.045$ ). During the pandemic, the proportion of women who never smoked decreased (from 71.19% in 2017/2018 to 41.76% ( $\chi^2=18.311$ ;  $p<0.001$ ). Similarly, the proportion of people who did not drink alcohol decreased from 22.48% to 12.34% ( $\chi^2=6.211$ ;  $p=0.013$ ). This was mainly due to men, among whom the percentage decreased from 20.00 to 6.35 ( $\chi^2=5.736$ ;  $p=0.017$ ). For the last 12 months, 38.10% of male and 23.08% of female respondents would drink at least one dose of alcohol with a frequency from "1-2 days a week" to "daily". Smokers were more likely to report this: both men (53.70% vs. 16.00% of non-smokers), ( $\chi^2=14.660$ ;  $p=0.001$ ) and women (42.31% vs. 15.38% of those who did not smoke), ( $\chi^2=7.583$ ;  $p=0.006$ ). Lifestyle changes since the beginning of the pandemic were reported by 77.27% of respondents – 65.08% of men and 85.71% of women ( $\chi^2=9.026$ ;  $p=0.003$ ).

The frequency of visits to the family doctor during the pandemic among men did not change; exactly half of them visited the doctor before the start of the pandemic (at least 1.5 years ago). Similarly, in 2017/2018 – 49.00% of respondents did not go nor had a visit to the doctor more than a year ago. Women were more responsible: 72.53% of them went to the doctor within a year or a year ago (in the previous study, the indicator was lower – 59.32% ( $\chi^2=3.942$ ;  $p=0.048$ ). Half of the respondents (50.65%) used the summer decline in the incidence of COVID-19 to prepare for a new pandemic wave without a significant difference by gender. Table 1 responds of the determinants gave respondents a high probability of considering themselves protected from the subsequent outbreak of viral infection ( $P=0.92$ ).

**Table 1** The determinants that allowed respondents to consider themselves protected from the next outbreak of viral infection

The determinants	Considered themselves protected (%)	Did not consider themselves protected (%)	$\chi^2$	p-value
Overall lifestyle changes	87.18	67.11	8.833	0.003
Healthy diet	67.95	42.11	10.396	0.002
Physical activity	69.23	42.11	11.486	<0.001
Positive attitude to vaccinations	75.00	36.73	20.875	<0.001

Significantly, a positive attitude to vaccinations was closely associated with COVID vaccination ( $P=0.91$ ). With a positive attitude, 91.07% of respondents received at least one dose of the vaccine, and with a negative or neutral attitude – 16.33% ( $\chi^2=81.004$ ;  $p<0.001$ ). With a negative or neutral attitude to immunisation, the absolute majority of respondents (93.75%) were vaccinated as a "mandatory procedure" for travelling abroad, at the request of management, or to avoid strict restrictions during lock-down. Against the background of a positive attitude, the reason for vaccination was their safety and understanding of the need to form collective immunity (80.39%). Table 2 responds of the determinants had association with a doctor's health check at least once a year ( $P=0.58$ ).

**Table 2** Association of a doctor's health check (visit to the doctor) at least once a year

The determinants	Visit was	Visit was not	$\chi^2$	p-value
Alcohol consumption	17.07	43.06	12.514	<0.001
Commitment to the vitamins	69.51	45.83	8.850	0.003
Physical activity	65.85	44.44	7.126	0.008
Healthy diet	65.85	43.06	8.057	0.005

In the 2017/2018 comparison group, once-a-year doctor visits were associated with declared nutrition control - 66.67% vs. 45.31% ( $\chi^2=6.157$ ;  $p=0.014$ ). Respondents often ignored their doctor's recommendations for physical activity and avoiding frequent alcohol consumption. During the pandemic, 51.95% of respondents suffered from COVID-19. There was no correlation between the fact of the disease and the attitude to vaccination against COVID and the level of vaccination coverage.

#### 4. DISCUSSION

As a result of the study, it was possible to establish the features and rough patterns of the phenomena that were studied. A more detailed analysis of the established differences by gender and age group required an increase in the sample. The correspondence of

lifestyle characteristics between the two groups (2017/2018 and 2021), in particular, for maintaining a healthy diet, adequate consumption of fruit and fish, performing daily physical exercises, indicated comparability of the samples and gave grounds to link the following differences precisely with the new realities of the pandemic. The increase in consumption of sweets, especially by people under 25 and middle-aged people, and fatty, salty, fast food by men may have been the result of the chronic stress that the majority of the population suffered from. A 2017/2018 study of the economically active population showed a significant role of stress and depression for female smoking.

The prevalence of smoking among women of 16.7% in STEPS-Ukraine (2019) was consistent with our study (WHO, STEPS, 2020). However, in 2021, we see an increase in female smokers to almost 29%. Among men, the prevalence of smoking did not change, but during the pandemic, male smoking was closely associated with alcohol consumption. We emphasize that in the pre-COVID period among the economically active population, such a link was characteristic for women. In 2017/2018 successful men actively quit the bad habit, especially after 40 years. One in two respondents who reported walking (50.43%) did not consider themselves physically active, especially men (up to 60%). However, almost half of the men who did not state any of the types of activity suggested by the questionnaire considered themselves physically active, obviously by type of employment. So, in 2017/2018, every fifth male respondent mentioned a job related to physical activity. The desire to avoid additional contact (which led to a decrease in gym attendance), at the same time, increased the number of people walking, avoiding public transport.

Attitudes towards immunization against COVID-19 corresponded to the data for Ukraine for March 2021: 37% was loyal towards vaccination against COVID-19; 41% were against vaccination, the rest – neutral (SG Rating, 2021). An indirect relationship between lifestyle and attitude to immunisation in preparation, the development of protection against the potential threat of illness was shown. A positive attitude could indicate a higher level of health literacy. The associations found with a healthy lifestyle, particularly physical activity and a healthy diet, could confirm the patient activation. Moreover, a visit to the doctor for preventive purposes was associated with physical activity, adherence to taking vitamins and avoiding alcohol.

In a 2017/2018 study, predictors of the respondents' medical activity regarding their health (patient activation) identified the following determinants: adequate consumption of fruits and vegetables other than potatoes (healthy diet), gym classes 2-3 times a week (physical activity) and preventive visits to the doctor (Vlasyk, 2021). It was assumed that guided by a certain method of the patient activation, its highest level can be assessed by the ability of a person to act in non-standard situations in favour of their health (Hibbard et al., 2004; Davis, 2019). With the beginning of the pandemic, according to the survey results, it can be argued that a positive attitude to vaccinations and receiving services for their safety was the determinant that certifies the patient activation. WHO believes that decisive action to combat NCDs should become an integral part of the pandemic response and recovery from COVID-19 (WHO & UNDP, 2020), and the impact on behavioural risk factors remains one of the most effective.

## 5. CONCLUSION

The share of respondents who reported on nutrition control in general did not change (55% in 2021 and 56% in 2017/2018). However, there were changes in the rationing of sweets: its restriction 42% was reported in the pre-COVID-19 period and 23% during the pandemic ( $p=0.002$ ). The identified lifestyle changes during the pandemic (an increase in the consumption of foods that "helped" to transfer stress; a decrease/transformation in physical activity; an increase in the frequency of alcohol consumption and the prevalence of smoking among women) give reason to expect an increase in the incidence of NCDs in the future. For vaccination, a positive attitude of a person was crucial, which, along with physical activity, a healthy diet during the period of anti-epidemic restrictions, was associated with preparing a person for a potential encounter with a dangerous virus. A positive attitude to preventive measures (vaccination) against the background of a healthy lifestyle and regular preventive visits to the doctor could confirm a fairly high level of patient activation.

### Author's Contributions

Lyubov Vlasyk, Natalia Ryngach, Leonid Vlasyk contributed to the design, prepared the study protocol and questionnaire. Anastasiya Sukholotyuk, Oleksandra Kotenko, Tetiana Kolodnitska contributed to the data collection, analysis and interpretation of the result. Lyubov Vlasyk and Tetiana Kolodnitska contributed to drafting of the manuscript. Lyubov Vlasyk, Natalia Ryngach, Leonid Vlasyk contributed to reviewing and editing the manuscript. The final version of the manuscript was approved by all authors.

### Ethical Approval

The ethical research committee of the Bukovinian State Medical University, Chernivtsi, Ukraine, approved this study (minutes N8,

16.06.2022). All participants in the research gave their verbal and written informed consent.

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### Conflicts of interest

The authors declare that there are no conflicts of interests.

### Data and materials availability

All data associated with this study are present in the paper. The work is a fragment of the planned research work of the Department of Social Medicine and Health Organization of Bukovinian State Medical University "Substantiation and development of medical and social technologies for the prevention of major non-communicable diseases" (№ state registration 0120U102625).

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